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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/632,628	08/01/2003	Bradley J. Howard	2269-5862US (02-1563.00/	4766
24247	7590	06/01/2006	EXAMINER	
TRASK BRITT P.O. BOX 2550 SALT LAKE CITY, UT 84110			DHINGRA, RAKESH KUMAR	
			ART UNIT	PAPER NUMBER
			1763	
DATE MAILED: 06/01/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/632,628	Applicant(s) HOWARD, BRADLEY J.	
	Examiner Rakesh K. Dhingra	Art Unit 1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 March 2006.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,3-9 and 11-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-9,1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Response to Arguments*

#### 35 USC 102 (e) and 35 USC 102 (b) rejections

Applicant's arguments, see pages 9-12, filed 03/8/2006, with respect to claim 1 have been fully considered and are persuasive. The rejections of claim 1 has been withdrawn.

#### 35 USC 103 (a) rejections

Applicant's arguments with respect to claims 1-24, 41 have been considered but are moot in view of the new ground(s) of rejection as explained hereunder.

Applicant has amended independent claims 1,16 and cancelled claims 2, 10, 24 and 41. Since reference by Tsuchiya et al (US Patent 5,716, 534) in view of DeOrnellas et al (US PG PUB No. 2002/0139665) reads on the amended claims limitations, independent claims 1,16 have been rejected under 35 USC 103 (a) as explained below. Dependent claims 3-9, 11-15, 17-23 have also been rejected under 35 USC 103 (a) as explained below. Reference by DeOrnellas et al (US PG PUB No. 2002/0139665) is still good since amended claims 1,16 do not recite any limitation regarding relative disposition of upper and lower electrodes (that is being directly opposite to each other) and thus electrode 26 in DeOrnellas et al (Figure 1) could still be considered as upper electrode. Similarly reference by Tsuchiya et al is still valid since amended claims 1, 16 do not recite the details of activation control of three generators by the controller (as shown in Figure 4 of the applicant's invention).

### ***Claim Rejections - 35 USC § 103***

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 1, 5-9, 11, 14-17, 22, 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuchiya et al (US Patent No. 5,716,534) in view of DeOrnellas et al (US Pub. No. 2002/0139665).**

Regarding Claims 1, 16, 17: Tsuchiya et al teach a plasma apparatus (Figures 1, 30-33) comprising a vacuum chamber 2, first RF power generator 29 coupled to upper electrode 21 and second RF power generator 18 coupled to lower electrode (susceptor) 4 with chuck 8, for holding a wafer W. Tsuchiya et al further teach a CPU (controller) 20 that can be configured to selectively control the activation configuration (in a step manner or continuously varying) of first and second power generators 29, 18 during duty cycle of a process to enable optimize the etching process (column 4, line 45 to column 6, line 45 and column 12, line 5 to column 13, line 35).

Tsuchiya et al do not teach two power generators coupled to lower electrode.

DeOrnellas et al teach (Figures 1) two power generators 32, 34 coupled to lower electrode 28 (DeOrnellas et al – Paragraphs 023-0025).

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Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use two power generators coupled to lower electrode as taught by DeOrnellas et al in the apparatus of Tsuchiya et al to achieve enhanced plasma density so as to favourably affect the selectivity and control of etching process (paragraph 0005).

Regarding Claims 5-9, 11: Tsuchiya et al teach all limitations of the claims including that apparatus (Figures 1, 30-33) uses CPU (controller) 20 to control power supplies 18, 29 for ON/OFF (active /inactive) modes to optimize the etching parameters (column 9, lines 1-15 and column 12, lines 45-65 and column 13, lines 1-25). Tsuchiya et al further teach that etching parameters can be optimized by appropriately selecting the parameters including phase difference and the power ratio of the generators (column 8, lines 20-25).

Regarding Claims 14,22: DeOrnellas et al teach that the first power generator 30 coupled to upper electrode 26 operates in the frequency range of 2 Mhz to 950 MHz which encompasses the claimed frequency range of 40 MHz to 100 MHz. It would be obvious to optimize the frequency as per requirement of density of etch plasma (paragraphs 0023, 0025).

Regarding Claims 15,23: Tsuchiya et al teach that power generator 18 (third power generator) operates at a frequency of 13.56 MHz, which anticipates the claimed frequency range of 1 MHz to 13.5 MHz (column 6, lines 1-10).

**Claims 3, 4, 12, 13, 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuchiya et al (US Patent No. 5,716,534) in view of DeOrnellas**

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**et al (US Pub. No. 2002/0139665) as applied to Claim 1 and further in view of**

**DeOrnellas et al (US Patent No. 6,492,280).**

Regarding Claim 3: Tsuchiya et al in view of DeOrnellas et al ('665) teach all limitations of the claim except two AC power generators coupled to lower electrode and where the second power generator is configured to operate at a frequency of at least three times an operational frequency of the third power generator.

DeOrnellas et al ('280) teach an apparatus (Figure 6) that has two AC power generators 48, 50 coupled to lower electrode 42 and where RF source 48 has a frequency of 450 KHz and RF source 50 has frequency of 13.56 MHz, that is frequency of second generator 50 is three times that of third generator 48 (Column 5, lines 1-10).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use two AC power generators coupled to lower electrode with frequencies as taught by DeOrnellas et al ('280) in the apparatus of Tsuchiya et al in view of DeOrnellas et al ('665) to enable control ion density and ion energy simultaneously (DeOrnellas et al {'280} – column 5, lines 1-65).

Regarding Claim 4: DeOrnellas et al ('280) teach that two RF sources 48 (450 KHz) and 50 (13.56 MHz) {second and third power generators} are coupled with lower electrode 42, and also teach a controller 54 for sequencing the power supplies (column 4, lines 65-67 and column 5, lines 1-10). DeOrnellas et al ('665) teach an RF power source 30 (frequency – 13.56 MHz, and which can range upto 950 MHz) connected to upper electrode 26 (claim 1 does not indicate that upper and lower electrode are disposed to face each other directly). Thus frequency of first power generator 30 is greater than

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frequency of second power generator 50 and third power generator 48 {DeOrnellas et al ('665) – paragraph 0023 and DeOrnellas et al ('280) – column 5, lines 1-10}.

Regarding Claims 12,18,19: Tsuchiya et al in view of DeOrnellas et al ('280) teach that the first power generator 29 (Tsuchiya et al, Figure 1, Column 6, lines 1-30) is capacitively coupled to the upper electrode 20 and the second and third power generators 48, 50 (DeOrnellas et al, Figure 6, Column 7, lines 55-60) are capacitively coupled to the lower electrode 42.

Regarding Claims 13,21: DeOrnellas et al ('280) teach that the second power generator 50 could operate in MHz frequencies ranging from about 1 MHz upto multiples of 13.56 MHz which encompasses the claimed frequency range of 13.5 MHz to 60 MHz. It would be obvious to optimize the frequency of the generator as per required ion density (column 5, lines 1-10).

Regarding Claim 20: DeOrnellas et al ('280) teach that RF source 48 has a frequency of 450 KHz and RF source 50 has frequency of 13.56 MHz, that is frequency of second generator 50 is three times that of third generator 48 (column 5, lines 1-10).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone

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number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free)..



Rakesh Dhingra



Parviz Hassanzadeh  
Supervisory Patent Examiner  
Art Unit 1763